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(19)

(54) SHAFT-BEARING ARRANGEMENT

(71) We, S.K.F. COMPAGNIE D'APPLICATIONS MECANIQUES, of 1, Avenue Newton, 92140 Clamart, France, a French Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a shaft-bearing arrangement capable of supporting both radial and axial load and comprising, opposite the corresponding section of the shaft, at least one annular member or ring force-engaged on said shaft and provided with an external conical surface, which rotates in a bearing which is movable relative to the shaft. This type of bearing is generally used as a thrust-block bearing, more particularly in an assembly comprising two inverted cones making it possible to achieve translational immobilization in the longitudinal direction of the shaft vis-a-vis a mechanical part, this occurring in one of two cases, either when the mechanical part rotates about the shaft which is stationary, or in the opposite case when the mechanical part serves to support the rotating shaft.

To this end conical roller bearings are already known and these are suitable for rotations of shafts subjected to weak oscillations. They make it possible to obtain satisfactory stability of articulation and at the same time provide a possibility of recovering play caused by wear, but they are expensive or at least incompatible with the design of sturdy but simple mechanisms or even those which do not function under continuous rotation. There are also self-lubricating bearings which are provided on the inside with hardened materials. These latter require the provision of lateral wedging by means of stop members; they are subject to a significant amount of wear and the play on the diameter is not recoverable. Conical rings mounted on the shaft have also been proposed, and these are in contact with solid bearings which have a conical interior surface provided with anti-friction material, this solution being excessively rigid however and very expensive in terms of machining.

The invention removes these drawbacks by applying a solution which is not only cheaper than those referred to previously, while at the same time maintaining the advantage of possibly recovery or compensation for play due to wear, but further achieves a certain flexibility between the shaft and the mechanical part in which it is engaged.

According to the present invention there is provided a bearing arrangement for providing bearing support between a block and a shaft, comprising at least one annular member adapted to be force-engaged on the shaft and provided with an external surface which is at least partially conical, wherein said external surface is in contact with the external surface of a ring formed by an annular sector of metal rolled up into the shape of a frustum of a cone and provided on said internal surface of the ring with a lining of bearing material, said ring being located in a housing member intended to be received in and fixed to the block, to allow relative rotation between the ring, housing member and block on the one hand, and the shaft on the other hand.

Thus in the bearing arrangement of the type defined above the surface of the conical ring or annular member fixed on the shaft is in contact with the internal surface of a ring formed by an annular sector of metal rolled up into the shape of a frustum of a cone. The housing member is made of plastics material and intended to be fixed by means of its external part into the block which provides support for the shaft or may be moved in rotation relative to the shaft.

The housing member is preferably moulded on to the ring and it may be constituted of a plastics material so chosen as to resist extrusion when heavily laden, for example comprising a glass-fibre reinforced resin.

[Price 33p]

In an assembly acting as a bearing it is thus now possible to recover wear by means of lateral contraction of the conical surfaces in contact at the same time as an oscillation facility due to th plastics material.

Th present invention will now be described, by way of exampl , with referenc to the accompanying drawings, in which:—

Figure 1 shcws a sectional view of part of a bearing;

Figure 2 is a section of a cable-return pulley rotating on an inclined axis and having bearings as shown in Figure 1.

According to Figure 1 a shaft 1 is provided with a frusto-conical ring 2 which is force-fitted in the same manner as in a conventional roller bearing. An assembly, referred to in *toto* as 3, is mounted on this ring 2, and comprises a ring 4 and a member 5. The ring 4 is formed from a blank in the form of a sector of an annulus, cut out in a sheet metal plate coated with self lubricating material. This material may be a composite layer obtained by roasting of a thin layer of porous bronze subsequently impregnated with a lubricant. The annular disc is then rolled up in the form of a frustum of a cone to form ring 4 onto which a member 5 made of plastics material is cast. Member 5 is annular and has a cylindrical external surface with retaining portions 5*a* to 5*b* on both sides of the ring. The plastics material is chosen so as to resist extrusion when heavily laden and may be for example a glass-fibre reinforced resin. Its characteristics may be varied according to the load which is required and the type of constraint to which the block bearing is subjected.

It is possible by means of this arrangement to benefit from the advantage of a conical swivelling action, more particularly provides axial resistance and recovery of wear, without suffering the drawbacks associated therewith, by virtue of the fact that the assembly formed by the bearing and its internal ring is assembled as a simple bearing between a cylindrical shaft and a cylindrical bore, both of which are much easier to achieve within the desired tolerances than conical parts.

The bearing arrangement which receives the assembly of bearings may be of a variety of forms depending upon the mechanical uses intended. An example is given in Figure 2. This relates to a guide cable block or pulley, referred to as 6 in *toto*, and used as a bevel gear. In this case, a cable 7 passing into the throat 8 of the block or pulley exerts a force F which imparts a torque reaction on to the stationary shaft 9 supporting the pulley 6. This inclined shaft 9 is integral with an angular support 10 which is not described in more detail. A sheath 11 may engage on the shaft 9 to the point where it abuts against a flang 12 of the support 10.

The boss 13 of th block or pull y comprises cylindrical surfaces 14*a* 14*b* in each of which a member 5 is located. It is possibl to mount, between th sheath 11 (which is unmounted from its shaft) and the surfaces 14*a*, 14*b* of the block, the assembly of frusto-rings 2 and bearings with their ring 4. On an end adjacent the support 10, the sheath 11 supports a ring 15 on which there is set a flat cover-plate 16 which closes the corresponding end of the boss 13. A second wedging ring 17 forms a lateral bearing surface between the ring 16 and the frusto-conical ring 2 situated on the same end of the sheath 11. On the end furthest from the support 10 a third ring 18 bears against the lateral face of the corresponding conical ring 2. Ring 18 is wedged by a fourth ring 19 mounted on the extremity of the sheath 11 and projecting onto the extremity of the sheath 11. Shaft 9 terminates in a threaded stud bolt 20 on which is screwed a locked nut 21. Nut 21 presses a washer 22 against ring 19 so as to permit control of the conical ring 2 in case of wear. The bringing together of the ring 2 situated towards the free end of shaft 9 relative to the ring situated on the other end adjacent the support 10 clearly makes it possible to compensate for play. Due to wear a second flat cover-plate 23 on ring 18 fulfils the same function symmetrically as cover-plate 16.

It is to be understood that the present example of Figure 2 is given strictly by way of an illustrative example of an application of the present invention in which the part which rotates relative to the shaft 9 is subject to a variable force with a low speed of rotation which does not involve the use of roller bearings, ball bearings or needle bearings.

The invention may be modified in various ways without its scope being thereby exceeded.

WHAT WE CLAIM IS:—

1. A bearing arrangement for providing bearing support between block and a shaft comprising at least one annular member adapted to be force-fitted on the shaft and provided with an external surface which is at least partially conical, wherein said external surface is in contact with the internal surface of a ring formed by an annular sector of metal rolled up into the shape of a frustum of a cone and provided on said internal surface of the ring with a lining of bearing material, said ring being located in a housing member intended to be received in and fixed to the block, to allow relative rotation between the ring, housing member and block on the one hand, and the shaft on the other hand.

2. A bearing arrangement as claimed in Claim 1, wherein the housing member is formed of plastics material and is cast onto the ring, the housing member having an external cylindrical surface.

3. A bearing arrangement as claimed in one of the preceding claims, wherein the annular member has a cylindrical bore.

4. A bearing arrangement as claimed in Claim 2 or 3, wherein the plastics material of the housing member exhibits relatively high resistance to extrusion when heavily loaded.

5. A bearing arrangement as claimed in Claim 2, 3 or 4, wherein the plastics material is a glass-fibre reinforced resin.

6. A bearing arrangem nt substantially as herein befor described with reference to the accompanying drawings.

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1383157 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG.1

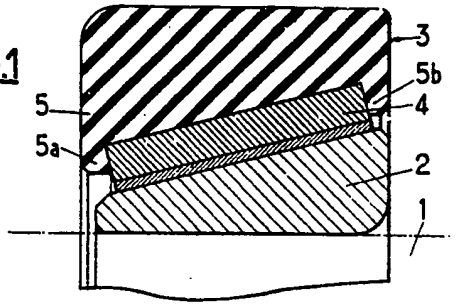

FIG.2